This book presents a possible mechanism of neurobiological and physical basis of thought production and memory formation.

The book is divided into four sections. The first section deals with thought production. A very novel concept of thought as a hologram, based on biophotons production in the synaptic cleft, has been introduced and developed.

The second section talks about the nature of memory; its production; its possible location in the brain and outside it; and possible mechanism of its removal.

The third section talks about how thought can be transmitted from the brain and what laws could make it happen. Connected with this is the process of knowledge perception where the novel concept of quantum entanglement is used to describe it.

And the last section deals with how human thought could interact with matter and gravity. Some speculative ideas on how it may happen, based on the concept of deep thought as a soliton, are explored in this section.

Anil Rajvanshi is a spiritual engineer! A mechanical engineering graduate of IIT Kanpur in early 1970s he went to U.S. for higher studies. After receiving a Ph. D. in Mechanical Engineering and teaching for 2.5 years at University of Florida (UF) in 1981, he left a very lucrative career in U.S. and came back to rural India thinking that he will change India! India did not change but he changed. In the process of developing renewable energy technologies for rural areas he discovered himself and the great spiritual traditions of India.

He runs a small rural NGO called Nimbkar Agricultural Research Institute in Phaltan, Maharashtra and has a passion of writing articles on spirituality and rural development. His articles have been published in Times of India (Speaking Tree); Huffington Post and Thrive Global, South Asia Monitor and syndicated in various other News lines. He has 7 books to his credit and has written more than 350 articles on rural and sustainable development including the interface of spirituality and technology. For his work he has received prestigious National and International awards including a Padma Shri from Government of India He is passionate about teaching youngsters and gives inspirational lectures all over India and some abroad.

His mantra is Spirituality + Technology = Happiness and lives in a simple and holistic way in rural India.

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WHAT IS THOUGHT?

Neurobiological and physical basis of its production, transmission and interaction with matter

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What is Thought?

Physical and Neurobiological Basis of Its Production, Transmission and Interaction with Matter

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The complete audio book is available here.

Preface

In 2004 I wrote my first book entitled "Nature of Human Thought". In it and in subsequent edition I tried to cover some ideas on how thought is formed and transmitted. The ideas were speculative in nature, but I tried my best, with the knowledge available at that time, to explain the mechanism of how thought could be formed in the brain and transmitted. The basic framework was explained but the details were missing.

Since then, I have thought a little more about the subject and I present in this booklet a possible mechanism of neurobiological and physical basis of thought production and memory formation. And furthermore, a possible mechanism on how it is transmitted and its interaction with matter and gravity. I also speculate on the unexplored possibilities which might provide a detailed mathematical foundation of the nature of individual thought.

Almost all of us, sometime or the other in our life, have gone through the experience of feeling that somebody is following or watching us. Whether it is a human being or an animal it makes us turn our neck to see what it is and investigate. Similarly, there have been innumerable instances where people and animals have sensed danger much before it strikes them. What is the nature of the signal that tells our mind that somebody is watching us intently or there is a lurking danger and how is that signal generated and sent from the pursuer's brain? In other words what is thought and how is it generated and transmitted?

I have been exploring and writing about these issues since 1977 though the desire to understand them started from my childhood when I started practicing spirituality in earnest. These ideas since 1977 were initially written down in a diary form and then distilled in my first book, "Nature of Human Thought" which was published in 2004 and its second edition in 2010. Recently I have written another book "Exploring the Mind of God – How

Technology Guided by Spirituality Can Lead to Happiness" which extends and explores mind-matter interaction issues further. Again, the details were missing and so in this booklet I have tried to explain them based on the existing physical laws.

Most of the times scientists scoff at these conjectural ideas and term them pseudo-science. However if in early 1800s somebody had told mankind about Einstein's theory of relativity and the space-time continuum, people would have had the same reaction as today's so called hard-core scientists have about mind/matter subjects. *The black magic of today is often the science of tomorrow!*

The spirit of science encourages us to conjecture and our imagination to flower and the only validity of such conjectures is the proof from experiments. It is my firm belief that we should have an open mind about mind/matter interaction and try to figure out how it could be possible. This booklet is therefore for those readers who have an open mind about such possibilities.

Structure of the booklet

The booklet is divided into four sections. The first section deals with thought production. A very novel concept of thought as a hologram, based on biophotons production in the synaptic cleft, has been introduced and developed.

The second section talks about the nature of memory; its production; its possible location in the brain and outside it; and possible mechanism of its removal.

The third section talks about how thought can be transmitted from the brain and what laws could make it happen. Connected with this is the process of knowledge perception where the novel concept of quantum entanglement is used to describe it.

And the last section is about how human thought could interact with matter and gravity. In the ultimate analysis this interaction with gravity may allow us eventually to get out of the earth's gravity field. Some speculative ideas on how it may happen, based on the concept of deep thought as a soliton, are explored in this section.

All the references to research articles are given as links in the text and also in the reference section.

I have been working on this subject of "What is Thought" on-and-off for the last 50 years. The trigger was a sudden idea that came to me in 1977 that human thought and gravity are related. This happened in Gainesville, Florida when I was deeply involved in my Ph.D. work on solar energy and the idea of gravity was as far removed from my mind as earth from the sun!

Yet this sudden and unexpected idea was so powerful that it caught hold of my mind for next 4-5 months and I could hardly concentrate on anything else. Since this idea came so suddenly and powerfully, I was convinced that it was true – otherwise it would not have come.

In 1981 I came back to India to work on rural development in our small NGO; Nimbkar Agricultural Research Institute. I therefore could only take up seriously the matter of spirituality and understanding of human thought in early 2000.

I am always reminded of Einstein's words of wisdom where he said that for somebody to do deep thinking on any issue, he should lock himself in a lighthouse! With no distractions the focus is achieved.

My small Institute is my lighthouse, and I feel very blessed and grateful to higher powers who have guided me and allowed me to focus on this and other deep issues and whatever little truth I have been able to glean has given me great joy and happiness.

The major source of inspiration for writing this booklet has been Patanjali Yoga Sutras. I have been guided by the spirit of sage Patanjali in the areas of human thought and mind-matter interaction. The more I study his sutras the more I realize the ocean of knowledge in his writings.

I have made this e-booklet freely available on the net for wider circulation and also because of my belief that knowledge should be freely available. The full book is available here.

This is my 7th book. For other books authored by me, the readers are encouraged to visit this site.

I am extremely grateful to my wife Nandini Nimbkar for editing it and to Shri S. S. Aherrao for typing umpteen drafts. Special thanks are due to Shri Rahul Pisharody for designing the cover.

Happy reading and I will be delighted to get your feedback and suggestions on how to improve the matter in this booklet.

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Phaltan. October 2024

Section 1: Thought

Introduction

Almost all of us, sometime or the other in our life, have gone through the experience of feeling that somebody is following or watching us. Whether it is a human being or an animal it makes us turn our neck to see what it is and investigate. Similarly, there have been innumerable instances where people and animals have sensed danger before it strikes them. What is the nature of the signal that tells our mind that somebody is watching us intently or there is a lurking danger and how is that signal generated and sent from the pursuer's brain? In other words what is thought and how is it generated and transmitted?

Since time immemorial mankind has thought, discussed and written about the origin of human thought. Religious writings are basically a discussion on it. Perhaps the greatest treatise on it has been Patanjali's Yoga Sutras, which to my mind is still one of the most definitive and scientific writings on the control of human thought. Patanjali's book is the oldest book on Yoga. It is believed that he wrote his book some time in 300 BC or even earlier though there is still dispute about the date. Patanjali defines Yoga as control of thought waves. This is probably the first definition of Yoga. He then describes how through Yoga, one can produce concentration and how this concentrated thought can be used to gain physical and spiritual powers for a person's ultimate enlightenment.

Interestingly enough sage Patanjali does not address the central question of how and where the thought originates in the brain but gives details on how to control it for achieving mastery over natural forces. However recent developments in brain research make it possible to understand thought, mind and consciousness.

Generally human thought has been considered by philosophers, religious leaders etc. as non-material in nature. However, a result (thought) produced by a physical brain has to be physical in nature and should be governed by physical laws. I will attempt to throw light on what these laws could be. Most of the concepts presented here are intuitive in nature with very little mathematical formulation.

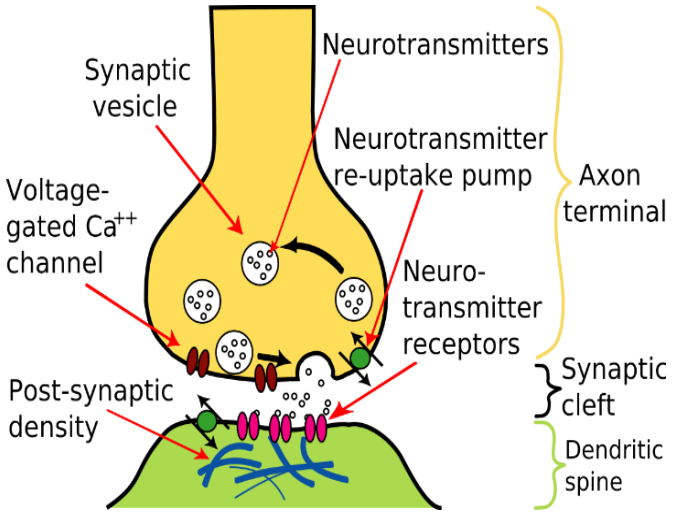
Scientists have conducted many studies all over the world to find out how the brain works. Magnetic resonance imaging (MRI) techniques, which are non-invasive in nature, are normally used in mapping the brain. Recently scientists have started using functional MRI (fMRI) for sharper images. Thus, fMRI scans are taken of the brain under different stimuli which show up on the computer screen as maps of blood flow in the brain. Scientists say that the place of maximum blood flow is the area where thought of a particular nature is generated. Yet no mechanism has been put forward on how thought is produced.

Human Thought Production

It is an accepted fact that a thought is produced when brain neurons fire. There are close to 80-100 billion neurons in the brain (the exact figure is not known). For a simple thought like what is the colour of a flower, form of a cat or dog, etc. a small portion of the neurons fire but in deep concentration leading to *Samadhi* and *Sanyam* (combination of concentration and contemplation on a single subject or an object for a long time) almost all the neurons fire to produce a deep thought. Thus, the difference between deep and shallow thought is its intensity and duration.

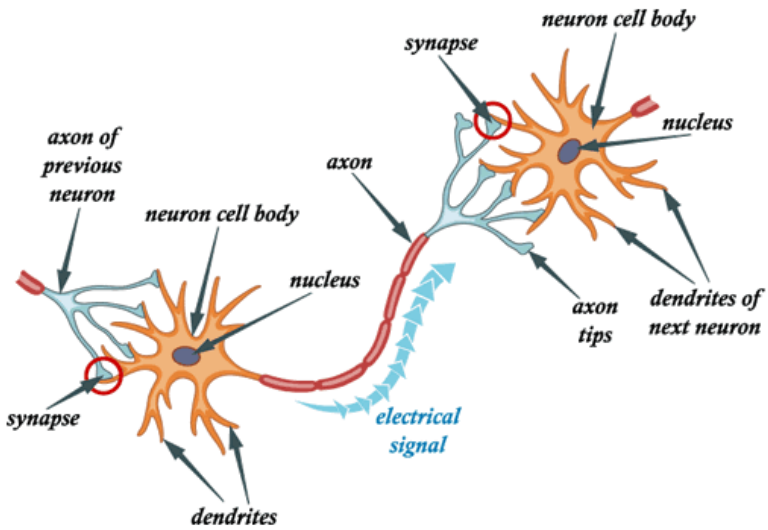
When neurons fire, they communicate with each other by forming neural pathways. Activation of neural pathways in turn triggers firing of neurons. This activation is triggered either by signals from sense organs or stimulation of certain memory space in the brain. Firing neurons helps them to communicate with each other.

During this communication electrical signal from a neuron is converted into chemicals (neurotransmitters) and transmitted across the synaptic cleft to another neuron where it is again converted to electrical signal for the onward journey.



Synaptic cleft is a tiny space of about 20 nanometers (nm) between an axon and a dendrite and is the place where two neurons exchange information via neurotransmitters (NT).

A neuron has three parts. At one end is dendrite which accepts NT from other neurons; the central nucleus which is the heart of neuron and a long nerve fiber called axon whose end (synapse) releases the NT for transmitting to another neuron. *A large number of neurons connected like this forms a neural pathway.*



Why did nature produce this type of diode-based communication system where the electrical signal from the neuron, which goes in one direction, is

first converted into chemicals (neurotransmitters), and transmitted through synaptic cleft and again converted back into the electrical signal in the next neuron?

A possible answer could be that during this conversion in synaptic cleft, weak biophotons are produced which are the signature of thought. Anytime a chemical reaction takes place (production of NTs and their acceptance in NT receptors are such reactions) it produces weak photons. *This is the nature of the chemical bond.*

Weak photon production was experimentally observed in the brain in the late 2010s when scientists detected them being emitted during the firing of the neurons and transfer of neurotransmitters across the synaptic cleft. Scientists are still not sure in what way brain uses these photons but speculate that somehow, they may help in increasing communication between various parts of the brain.

The weak photons produced have broad spectrum in the range of 200-950 nm though we are not yet sure what is the peak of the emission. In this range the cerebrospinal fluid in the brain (which is 99% water) is nearly transparent. Thus, the biophotons can easily communicate with each other across the brain.

I conjecture that these photons from large number of neural pathways synchronize via a non-linear process to form a three-dimensional hologram which we can call a thought. Hence the origin of thought probably occurs in synaptic clefts!

Each thought, however, is the result of activation of a unique set of neural pathways though we still do not know how many neural pathways are needed for it. **In fact, the formation of such unique neural pathways is the memory**. *So neural pathways are the memory and neurons firing in these pathways produces a thought.* With practice and constant flow of electrical

signals through these neural pathways, memory of that particular object gets strengthened.

But how do the photons from millions of synapses synchronize and form a coherent thought? For that we will have to examine the brain complexity, understand large number mathematics and possible synchronization mechanism.

Brain Complexity and Synchronization of Thought Photons

Just to give a sense of complexity of the brain let us look at the numbers of possible neural pathways in the brain. There are close to 80-100 billion neurons in the brain. Each neuron has many dendrites and axons which connect it to other neurons. Recent scientific evidence also suggests that besides neurons another type of cells called glial cells also take part in communication.

Glial cells outnumber neurons by nine to one and can modify the signals transmitted by each neuron though the exact mechanism is not known. There are therefore estimates that 10^{15} synapses in the brain maybe involved in communication. Thus, the number of different combinations for neural pathways and thought production are mind-boggling. That is the reason why the human mind can generate millions and zillions of thoughts!

However, the photons from each synapse must be synchronized with others to produce a stable thought structure. This synchronization takes place via the positive feedback type mechanism so that each photon is influenced by others and is guided by an entity called 'I' (ego, will, sense of identity, etc.). This is similar to the mechanism where fireflies in large numbers synchronize their firing. I conjecture that this type of synchronization might produce a hologram.

Ego somehow acts like a symphony director and helps provide the necessary energy and focus to maintain a given thought for a certain time. It also constantly compares it with the signals from outside (those we receive through the senses) to give us a sense of reality.

We still do not completely understand how ego, or 'I' can influence this process, but just like the music conductor who determines which part of the orchestra plays for how long, 'I' decides how long a particular thought will remain in the "vision" field. *This process is called concentration and seems to also exist in other animals.*

With practice, concentration becomes strong till a person can nearly make all the 80-100 billion neurons fire in a laser-like fashion for a long time on a single thought. This is the genesis of meditation or *Samadhi* and results in *Sanyam* according to Sage Patanjali. According to him *Sanyam*, done on any subject results in its complete knowledge. Thus deep concentration is the basis by which all great discoveries in science, art, and any other human endeavor are made.

This deep thought produced continuously also helps dissolve memory knots of *the brain* since this activity requires increased number of neural pathways and hence the loosening of existing memories. We will discuss this in detail in the next section (section 2).

Patanjali says that removing memory knots or *sanskars* makes the mind clear like a crystal so that any object or subject occupies the whole brain. Or in other words when memory knots are resolved the processing power of the brain increases exponentially and allows the brain to focus on a single object or subject in a laser-like manner. Hence the reference to crystal-like clarity of the brain.

The production of weak photons for thought formation could also be the reason why many Yogis have experienced seeing white light during intense

meditation. Similarly the observation of white light by persons during near death experience (NDE) could be an outcome of nearly all the brain neurons firing during the final exit.

Unexplored Possibilities

Here are some of the unexplored and speculative possibilities which can give mathematical formulation for thought production.

1. We still do not know how many Neurotransmitters (NTs) are released per firing of neuron.
2. There are speculations that it is anywhere between 2 and 20.
3. Also, the molecular structure of each NT and receptor is not fully understood.
4. Besides how many of these NTs are captured by receptors of the next neuron is also not known?
5. The problem is compounded by the fact that we do not have the technology to see real time happenings in the synapse.
6. If we can find the number of NTs released and their capture by receptors then the energy and frequency of biophotons can be calculated and a possible hologram could be created from this data.
7. That will be the first attempt at calculating the structure of a single thought!

Section 2: Memory Production and Removal

Introduction

We are defined by our memories. They are the only things we can call our own. All our experiences, ego, I, and our existence is the sum and substance of our lifetime memories. They guide us on our future journey in life and till the end of our existence those memories are with us.

Most of our memories can be divided into pleasant and unpleasant ones. These memories give rise to a whole range of emotions – love, hatred, jealousy, fear, happiness etc. To live a good and happy life we should strive to have mostly pleasant memories and see how the unpleasant ones can be reduced or removed. One of the main tenets of Indian *Yogic* system is complete removal of our memories at the time of death or the final exit so that we are liberated from the cycle of birth and death. The residual memories remaining at the time of death create conditions for reincarnation and could form the basis of karma.

But what are memories; and where in the brain they reside; how are they formed; and what is the possible mechanism of their removal? We will try to explore and explain these issues based on some of the material presented in previous section.

Previous research

Memory, its origin, and spatial location in the brain has been researched for hundreds of years. Extensive literature on it exists and hence this article is not a place to write the history of memory research, but we will briefly touch the salient features of previous research.

One of the seminal works on memory was done by Eric Kandel who got the 2000 Nobel Prize for his work on this subject. Kandel's main discovery was that synapse plays an important role in memory formation and the

consolidation of memory changes the synapse itself. Though this pioneering work on neurobiological basis of memory showed the process of memory formation and consolidation in few neurons but it did not show where the memory is located and how is it related to consciousness.

At the same time the existing theories on neurological basis of memory formation also do not explain the pliability and plasticity of neurons and neural networks. Scientists have recently found that with time the original neural networks shift spatially and yet are able to retain the same memory. How this happens is still a mystery and thus we do not know where the memory exists and exactly what it is.

Memory formation

As we saw in **Section 1** memories are nothing else but the arrangement of neural pathways and the sequence of their firing. Neural pathways are made the moment brain starts forming in the womb. Very rudimentary memory of movement, swallowing, etc. starts in the second and third trimester of pregnancy. Prenatal memory starts forming around 30 weeks after conception. After this time, the fetus is affected by the food the mother consumes. A fair amount of good data exists on how alcohol and drug use by mothers at this stage affect the children later in life.

The moment a child is born there is an explosion in memory formation. A child's brain is like a sponge for information intake since neural pathways must be established. So, the sound, smell and other sensory organs start sending signals to the brain for the formation of neural pathways.

Nevertheless, I feel that the basic memory which exists in every life form at the time of birth is the preservation of its form. How this memory is inbuilt in genetic code is still a mystery. This form-preservation memory gives rise to primeval emotions like fear and the desire to procreate – both basic instincts to preserve the form. Both these memories are eternal to life and part of evolutionary process. I feel a living being with consciousness is distinguished

from a non-living entity (robots, AI powered entities, etc.) by these primeval emotions.

However, the first solid memories are those when eyes start focusing. The input signals from the eyes are coordinated with those from the ears and help establish and stimulate the neural pathways which results in the formation of a random thought hologram. *This hologram is compared with the actual object and, when after many comparisons the exact match takes place, then the memory is etched in the brain.*

The "comparer" of reality and hologram in this case is the nascent ego of the child which is still developing but is not strong enough to focus on a particular thing for a long time. This results in memories being formed and forgotten. Though the brain at this age is like a sponge for absorbing information, the lack of focus does not allow the memories to become strong.

This is the reason why children have very few memories till the age of 2-3 years. With the developing of ego as we age, longer focus results and hence a stronger memory. The memory is further strengthened when the child repeatedly performs the process of seeing, validating, and memorizing. This also helps in making neural pathways stronger when the child repeatedly produces the thought hologram of a given object.

Children are therefore particularly good at doing mundane things repeatedly because this is how they set up and consolidate their memories. Since the brain is virgin in childhood, those repeated early neural pathways are strong and thus some of the childhood memories (after the age of 3-4 years) are very powerful.

Many times, the parents get exasperated with a child repeatedly performing these mundane actions and scold the child. This should not be done because scolding creates fear-complex memories, and the new learning is retarded.

As we grow older this process of memory formation and consolidation is repeated and a whole network of neural pathways is formed. The sum and substance of our experiences and memories give rise to our sense of self and is the genesis of ego.

If the memory is not strengthened by repeated experiences, then those neural pathways are used for something else and the memory becomes weak and maybe lost as happens in children till the age of 2-3 years. Therefore chanting, rote learning and associating the images with signposts, etc. are ways of strengthening the memory. This is the best way to create strong memories at any age of our life.

However, there are some people who possess photographic memory. They can immediately remember most of the details the moment they become aware of it. This happens because their brain possesses superior processing power and is mostly inborn and may have a genetic element to it.

Our memory formation is based on the sequence of events received through our senses and hence the time is embedded in the memories. They are replayed as a movie and thus the sequence of events tells us about the passage of time. This is the genesis of time perception.

Since the neural pathways are formed sequentially, during recall, one set of neural pathways triggers another set. It is therefore quite possible that the *neural pathways of such events may reside close to each other in the brain otherwise sequencing may be difficult.* This triggering of sets of neural pathways is probably facilitated by the ego. When ego becomes weak the triggering is reduced, and the sequencing is lost. This happens temporarily during dreaming; and permanently in dementia, Alzheimer's disease, and other brain maladies.

The proximity of neural pathways may also explain why one type of thought triggers other thoughts of similar nature! Thus, both dark and pleasant thoughts come in bunches.

Cellular Memory

Besides the brain memory it is hypothesized there is another memory in human beings, called body memory – a product of cellular memory. This supposedly happens because all the cells of the body have their own memory, and since they reside in different parts of body this results in body memory.

We exist because of cells. Cells are the basic building blocks of all living things and every part of the body contains cells. There are about 40 trillion cells in human body (including those in the gut bacteria) though the exact number is not known. They vary in sizes depending on their function but have an average size of 20-30 micrometers.

Cells are basically mini factories; they take material from surroundings and convert it into energy; create new materials (genetic information); create structures like bones and muscles; and also replicate themselves. Thus they take part in managing every aspect of the body function.

Cells also have memory which they get through the system of epigenome, and it can be conjectured that the combined memories of all cells form the part of body memory. Epigenome is a system that controls how genome is modified, packaged and expressed in a cell. Some of the cells also have long term memory. We still do not know how all the cellular memories organize to form body memory. This body memory also gives rise to memory of form and sense of self and hence occupies a major portion of the brain.

For smooth running of the body cells also communicate with each other. Communication among them takes place mostly by chemical means (by exchange of molecules similar to the process of neurotransmitters exchange that we discussed in Section I), and this exchange of molecules produces

photons as a byproduct of chemical reaction. This helps cells communicate photonically. Photonic communication is the fastest way for cells to communicate with each other and with other parts of the body.

Cells communicate for help in growth, development, differentiation, etc. and also to transmit danger signals (during certain cell death). Besides they also communicate to activate the immune defense system when injury or infection takes place.

This reaction by cells to danger sometimes results in producing inflammation and pain. Inflammation helps in the healing process but sometimes it goes out of hand (nobody knows why) and this leads to runaway events like cancer and tumor formation and other situations where cell production gets out of control.

Cell death nevertheless is a natural process and around one million cells per second die in our body. This translates to removal of ~ 1.2 kg of cells/day. This is an essential process for keeping the body healthy and sanitized. So for a healthy being not only we should have a good mind but a healthy body in which all the cells work and communicate harmoniously with each other and with the brain.

Memory Removal

In everybody's life there are both painful and happy memories. It will be wonderful if somehow, we can get the ability to reduce or remove those painful memories. Then we can have a better and happier life. Most people think that if we do not think about the painful memories then they are gone. But painful memories produce strong psychological knots which remain buried in the brain. When by some trigger they get reactivated, the pain comes back again. To remove the pain a mechanism of actively removing such memories is necessary.

A possible mechanism of memory removal is to focus on a single thought for an exceptionally long time. It is called *Sanyam in Patanjali Yoga Sutras. Sanyam* requires large number of neural pathways since huge processing power is needed to sustain it. This may help in the removal of the other memories since their neural pathways is used for this particular thought. With discipline, willpower, and passage of time the brain can become very pliable so that *Sanyam* results effortlessly.

As Patanjali says in his *yoga sutras*; "*When a brain becomes powerful and nimble it is like a pure crystal which takes the color and shape of the object which comes in its view*". Such a brain is therefore able to focus like a laser on anything that occupies its vision field.

This process has also been corroborated by recent work in memory formation where scientists have shown that by thinking deeply on certain object the synapses are weakened for a short time. They can then be modified to form pathways for other memories. This plasticity of memory could be one reason why sometimes in extreme circumstances of brain surgery and removal of some parts of the brain, it can still allow a patient to work and form new neural pathways and hence memories.

This process of weakening neural pathways can help remove brain memories but the memory of form can only be removed at the time of death.

Memory removal at death is the most important aspect of Indian *Yogic* system which asserts that this leads to liberation from the cycle of death and rebirth. Also, with less memory attached to our soul during the final exit, we can tunnel through the drag of gravity and other souls and reach the other worlds. *This is the easiest way to get out of the earth's gravity field!* However, the residual memories at the time of death do not allow this escape and could be the cause of reincarnation.

Memory removal also helps with unraveling of memory knots, mostly made of emotional incidents, and helps in resolving emotional conflicts. There are many instances where the resolution of such conflicts helped people die peacefully. Another way to remove unpleasant memories is to cultivate the habit of continuously thinking about the pleasant incidences that have happened in our lives. It is a difficult process but trying regularly could help in resolving unhappy memories.

Many times, it happens that our PC's, laptops, and other computing devices become slow since they are cluttered with folders and other materials which take up the working memory space. After downloading most of the information on an external hard disk, the memory of the PC is restored, and it functions faster and smoothly. In the same way uncluttering of the brain (by removing the psychological memory knots) will allow it to function properly and faster.

Nevertheless, there are other powerful and intense memories which are the result of emotional and painful episodes. These episodes, when they occur, result in occupying the whole brain so that the focus of the brain is single pointed. It is almost like Samadhi. These memories are very difficult to erase but necessary to be removed for a happy life.

Removal of Cellular Memory

As discussed before brain has between 80-100 billion neurons which help form our memories whereas body cells numbers are ~ 40 trillion with corresponding memories.

Thus, body memory occupies a major portion of human memory landscape. This is partly because the form of the body is like an antenna for the brain and supplies information to it about the outside world through our senses. Thus body memory or cellular memory is an integral part of our memory system and could be the genesis of fear.

Death is the most traumatic experience for any living being. It is the final exit. Every form of life is afraid of death since it loses its form and the memories. It is an evolutionary process and is genetically ingrained in DNA. Every individual has memories of events, people around us and what has happened to our body during our lifetime. With death this is lost forever.

It is quite possible that this memory removal (both of brain and body) is painful and results in pain of death. Thus the pain during death is both emotional pain (shedding of brain memory) and physical pain (shedding of body memory). With painless death people may not be afraid of it.

It is also possible that during death there may be frantic conversation and synchronization between brain and body memories since both will be shed. We still do not know how the brain and body memories synchronize during this event. Photonic communication may provide a possible answer.

Most of the pain signals from the body reach the brain through the spinal cord. Ancient Yogis could stop these signals reaching the brain by the practice of Kundalini Yoga. It is a difficult procedure, but the possibility exists. Pain reducing agents or opioids do the same in modern medicine and with little effort on our part! Hence our fear of death is because of pain and fear of unknown.

But if we think of death as a part of continuum where part of our memories get reincarnated then we may have less fear of unknown. However reincarnation is by chance as Sage Patanjali has stated and could be in any form. When that happens, our memory processing (depending upon which form we are incarnated into) may be disrupted. That could also be the cause of fear of the unknown after death.

And finally to have a peaceful and fear-free death we should live a good and emotionally satisfying life. One possibility is to live in harmony with nature and all the surrounding forces.

One of the strongest force surrounding us is earth's gravity and magnetic fields. Our body and mind can interact with these fields. If right from childhood, we are trained through meditation to tune our bodies to these fields then probably the death may not be fearful and painful. This process will also make us live sustainably and then we can rightly be called *Earth People*. Our memories which will remain attached to the gravity field of earth will then guide us to a brighter future.

Can Memories Exist Outside the Human Brain?

It is possible that powerful emotional memories can form a very deep thought resulting in a stable soliton and can exist for a long time. I conjecture that such stable memories may reside in Knowledge Space (KS). Knowledge space could be equivalent to external hard disk or cloud storage where our strongest memories get stored automatically.

I define Knowledge space (KS) as a space which may contain information structures or memories which are very stable and will remain there for a very long time. This is similar to cloud storage. However, cloud storage is connected to our devices via cables and processors. Whereas the KS may be tethered to our gravitational field. How memories can go and reside in KS is discussed in **Section 3** (transmission of thought).

This knowledge space may also contain fundamental knowledge produced in the past and could be continuously fed by the ever-increasing knowledge from various civilizations as earth travels around the Milky Way Galaxy. A prepared and focused human mind can access knowledge from this space, and I feel that great discoveries of mankind have come from such access.

There are also indications that strong emotional memories may be attached to inanimate objects. There is a fair amount of data from all over the world where the mediums have been able to access the memories from such objects and it has resulted in new finds of buried ancient structures (almost 15-

20,000 years old); ability to tell sequence of events about unnatural deaths; and timelines of civilizations long gone and lost.

It seems that the physical objects (like a stone, bone or any other object used by the people long dead) are somehow attached to the memories of those persons in KS and the mediums are able to access them. In scientific language this ability is called "Intuitive Archeology". The mechanism of how this happens is not known and I have speculated on possibilities in **Section 3**.

Such ability to recall the memories or past events of people by simply touching them was shown by Swami Vivekananda – the Indian spiritual leader. This ability is alluded to in Patanjali Yoga Darshan; *"By doing Sanyam on other person's mind, a Yogi gets the knowledge of that person's thought waves but not the contents of his mind".*

It is also possible that KS may have templates of various life forms. The memories of life forms remain in KS because these forms existed for an exceedingly long time (couple of million years). Thus, either a deep thought for a long time or "nearly constant" life forms for a long time produce these stable memories in KS.

Even if the physical form disintegrates the ghost or memories remain in KS. This memory of forms or templates maybe the basis (besides the regular evolutionary forces) of new life forms for a young life-sustaining planet as it comes across KS in its journey through space.

We can also conjecture that the transfer of memories to KS from our brain is via a filter. Thus only deep emotional memories get transferred and mundane memories remain behind in the brain. This process helps to reduce the loading of KS. The mundane memories, however, are removed during death.

Complete Trace Removal

In the modern internet and world wide web if we want to completely remove our trace then firstly, we need to format our PCs and then remove all the information from the net. This is not easy since the deep web contains the archived material with which we have been associated, and it is exceedingly difficult to remove all of it. Thus, somehow and somewhere the past can catch up with us!

In the same way we need to remove memories from the brain and those from KS to get complete liberation from the cycle of birth and death. Just like the hard disk can be formatted or cleaned when it is attached to the PC or a similar device, similarly the cleaning of memories in KS can only be done by intense thinking via the human brain. And as Patanjali says in his *Yoga Sutras*, *"When the mutations of gunas cease to function, flow of time stops and Kaivalya (Nirvana) results"*. This results in complete removal of trace memories and liberation of yogi.

Otherwise, the traces of our memories in KS can force our rebirth either here on this planet or other planets. This could probably be the genesis of *Karma* concept so often mentioned in Indian philosophy.

Section 3. Thought Transmission

Introduction

Very often we have felt that when we are thinking deeply about somebody, lo and behold we get news about that person either by a letter, email or phone call. In this regards there is a celebrated case of Hans Berger, the inventor of electroencephalogram (EEG). Sometime in 1893 he was seriously hurt during horse riding. His sister, who stayed far away immediately sensed his condition and asked her father to send a telegram inquiring about him. Berger felt this was a clear case of telepathy and it made him think about how this could have happened. In the process he developed EEG to measure the brain waves in the hope that they somehow could be transmitted to long distances. Similarly, there have been few cases where some dogs know when their owners are coming home.

So, what is the signal that tells us about these things and how is that signal transmitted to long distances - in other words what is telepathy? Thus, in this section we will talk about how thought can be transmitted from one brain to another.

We have seen how the generation of thought and its validation of the outside world through the signals received from our senses, gives us a sense of reality. Besides, this internal churning in the brain makes us creative and gives us a sense of humanness. When we can resolve some of the memory knots through this internal churning, then it also gives us a sense of well-being and happiness. All these activities require intense concentration.

Nevertheless, a deep thought which is a result of tremendous concentration for a long time is also a leaky thought! It not only helps us evaluate various scenarios but is also automatically transmitted and has an effect on other's mind who are in the vicinity of deep thinker. This results in mind-bending experience (or the sense of danger) that some people feel when they are in the

presence of such beings. These thoughts can bring in the feelings of either peace and happiness or evil intentions depending upon the personality and mental makeup of the sender.

Presence of a Being

Very often people have felt a sense of well-being and happiness just being in the presence of an enlightened human being. These beings continuously produce a thought of high quality which leaks from their brain and affects anybody who encounters it. Similarly, there are other human beings who are evil and continuously think ill of society and how to harm others. These intense evil thoughts also affect people and have been the cause of a lot of misery in the world.

Some examples of this powerful brain interaction have been reported by UFO abductees. Most abductees felt very frightened when they encountered alien beings. They felt as if their whole life was sucked out of them and these encounters also wiped out all the memories of the event in the abductees. Patanjali has alluded to such a process in his Yoga Sutras: *A Yogi not only can read the mind of others but can also take command of his/her mind and body.*

On terrestrial level, these leaky thoughts from a powerful brain also create an aura, either good or bad, around the person, and is felt by everybody who encounters him/her.

At present this aura and thought cannot be transmitted by any known technological means like phones, video, internet, etc. The day we will be able to project or transmit them to large distances through our technology will be the day when man-machine interface will vanish.

Presently powerful thought can only be transmitted by human brains. I conjecture that it can also be transmitted over long distances, and we will explore it in this essay.

Nevertheless, in order to feel the presence or aura, one's mind should also be sensitive to the feelings. A person devoid of such sensitivity cannot feel a presence. Mind is both a receiver and a broadcaster of strong thoughts and a sensitive mind is able to receive them and feel the presence of the being.

However, a sensitive mind is sometimes a curse because it can be easily distracted by any strong thought it perceives. It therefore requires great willpower to ward off influences from a powerful mind.

We also sometimes hype ourselves into a state of awe in the presence of a well-known personality and do not see the flaws in that person. This hype is, however, sensed by these personalities, and they get an added boost to their energy levels. Besides it also helps them to control their followers. Many orators and public figures have experienced and commented on this.

Still, a genuine feeling of warmth, love, kindness and humility can only be felt when in the presence of a great soul. Thus, if all of us follow our basic gut feelings and meet such souls then we should be thankful for our luck. Such a person's friendship should be cultivated and cherished. *I also think this is a good way to judge a person's greatness.*

One can create a benevolent "presence" by developing a calm mind. Calmness of mind comes from internal security, which is an outcome of spirituality. A person who is at peace with himself/herself can radiate a tremendous calmness and help spread it. There have been many instances where people have felt this calmness in the presence of great souls like Mahatma Gandhi, Vivekananda, etc.

It is not necessary that only so called "god men" or well-known figures have a presence. Quite a number of times one can find such a presence in ordinary people. In fact, many times well-known people are very troubled human beings. Their stakes in power, position or money are very high and higher

stakes results in higher insecurity. They therefore frequently radiate this insecurity which tends to be quite unpleasant.

Thought Transmission

So how are these thoughts, aura, and presence radiated outside the brain and become leaky thoughts? Sage Patanjali has alluded to this in his sutras III-1-4 where he says that doing *Sanyam* on anything brings in great knowledge and wisdom.

Patanjali defines *Sanyam* as a combination of *Dhyan* (concentration); *Dharan* (keeping it in the vision field of our mind); and *Samadhi* (complete immersion in the object or subject of focus and inquiry). When *Sanyam* is done on anything, Patanjali says, a complete knowledge of the subject is achieved. This has been the basis of all the great discoveries and inventions of the world.

Our theory of deep thought hologram and its leaky nature follows this approach. We perceive reality by producing the hologram and validating it with signals from our senses. With concentration, mediated by ego, we try to keep that hologram for longer time in the vision field to evaluate the object or subject internally.

With even greater concentration this hologram acts like a laser because of its intensity; becomes leaky and gets transmitted to the outside world. This transmission then allows this hologram to interact with the object or subject of our focus in an induced fit type arrangement and gives back to us the signal whether the information or our inference is correct or wrong!

But how this interaction or the signal from the object of focus received by our brain? For objects that we can see and feel it is quite easy because our senses guide us in doing so. But for the concepts and subjects that we do not see and are beyond our reach what is the mechanism? *The science of quantum entanglement may provide a possible answer.*

Knowledge Perception via Quantum Entanglement

Quantum entanglement (Spooky action at a distance as Einstein described it) is a concept which states that when photons or even particles are created or generated, they are entangled with each other such that the knowledge of one can describe the other, no matter how far apart they are.

We can conjecture that our concentrated thought hologram that leaks out and interacts with the object or subject of perception somehow changes the property of hologram in the brain via the entanglement process. *This continuous dialogue between these holograms via entanglement brings us the knowledge.*

The increased concentration makes it possible to increase the frequency and intensity of the hologram interactions and it is quite possible that this intense thought behaves like a laser so that attenuation is reduced, and the induced fit type arrangement is established and maintained for considerable amount of time.

We also discussed in **Section 1** that thought holograms may have wavelength signature in the near and far infrared range. The human skull and hair are also nearly transparent in this range and hence it is quite possible that intense thought could easily be transmitted out of the brain. Besides hair may also act like an antenna and aid in the thought transmission and reception.

Normally a thought inside the brain dissipates rapidly since many new thought holograms are being produced. This results in brain chatter. However, a thought which is produced with intense concentration and for a long time may be transmitted easily as explained. The intensity of this hologram will also decide how far it can go since the $1/r^2$ attenuation (inverse square law) could dilute it rapidly.

So how does one produce a time-stable thought hologram which can travel to long distances? The science of soliton may be able to explain it.

Deep Thought Hologram as a Soliton

Soliton is a wave which can remain stable for almost infinite time and can travel great distances without dissipating. These waves arise *because of the far-from-equilibrium and hence non-linear nature of the wave phenomenon* and have been observed in liquids, gases, optics and even in space. When the conditions are right (non-linearity becomes intense) a critical threshold is achieved and according to Catastrophe Theory soliton structure can be formed. The word soliton is apparently derived from solitary wave which, being stable, behaves almost like a particle. Hence soliton rhymes with electron!

Concentrated thought hologram is a three-dimensional, far-from-equilibrium, wave and may follow the soliton laws. *It can therefore be conjectured that a thought hologram which is an outcome of tremendous concentration for a long time can form a soliton.*

This thought-hologram soliton may also interact with gravity and matter (details are given in the next section). Also the ability of this soliton to travel long distances and remain stable could be the basis of clairvoyant powers that some yogis have exhibited and to a limited extent experimentally observed. Anecdotal evidence suggests that Aurobindo Ghosh an Indian spiritual guru had an ability to sense thought packets sent to him.

Since thought solitons are very stable structures, it is tempting to think that they may form stable memories and may reside in Knowledge Space. These memories could also be the basis of Karma that is talked about in the Indian Philosophy.

Interesting Consequences of Thought Solitons

Telepathy

The soliton nature of concentrated thought may also shed some light on how telepathy might work.

The brain is both a sender and receiver of thought hologram. A normal thought soliton can travel to a large distance carrying information but sometimes it also dissipates with time and distance. These are called dissipative solitons and hence may not be able to carry all the information of the thought to the receiver's brain.

However, it is possible that the dissipative solitons may still have enough information so that the receiving brain is able to reconstruct the message from it and produce a coherent image. This is not difficult to visualize since we do this all the time in trying to decipher the world.

For example, sometimes a speech we hear is incoherent, but the brain has the capability to reconstruct it to make sense. Similar is the case of deciphering illegible writings. Our brain can extract and reconstruct coherent information from tiny bits of input signals. However, this requires a powerful brain which can look at all the eventualities and hence can reconstruct the underlying principle of information. This helps in sending and receiving telepathic signals easily and are less energy intensive.

Patanjali very eloquently describes this process (Sutras III-18 to 20) where he says that a Yogi through *Sanyam* on his thought process can develop the ability to read the minds of others but not their contents! Thought soliton can only interact with other's thought holograms and not their neural pathways!

This process of extracting information from tiny bits of information may also help explain how mediums can get the information by touching bones, furniture and other possessions of dead persons.

We can also conjecture that a very powerful and non-dissipative soliton could be the basis of final exit or Mahasamadhi as we will see in the next section.

Dreaming Brain

Similarly thought hologram may also explain the dreaming process. During sleep, ego is very weakened or nearly non-existent. Thus, the energy through the neural pathways during sleep is not focused and results in random brain chatter. This leads to thought holograms and dreams being produced in disjointed and haphazard manner. However sometimes this chatter dies down (though we are not sure how this happens) and results in a very deep, dreamless and relaxing sleep.

The dream production follows the bell curve where the average dream is disjointed and very shallow and most of the times, we do not remember them. Nevertheless the probability of dream production in outliers (tail of the bell curve) is very small but is finite and exists; and may create conditions for the production of thought solitons and hence leaky thoughts. This brain condition during sleep then becomes receptive to the outside knowledge which may result in prophetic dreams.

Section 4. Interaction with Matter

Introduction

Throughout the history of human civilization there have been many instances where so-called "miracles" have been performed. These have included levitation, production of material things from thin air, physical healing, etc. The nature of these miracles is the same, irrespective of religion and different civilizations. Some of their accounts have been exaggerated and found fraudulent but a fair body of data shows remarkable consistency in their nature and reporting though the producers of such miracles always claimed that God or higher forces and entities use them as medium.

However, I feel that these *events have taken place because of the interaction of human thought with gravity and material surroundings.* After all, a thought produced by the physical brain must be physical in nature and hence governed by certain scientific laws. Thus, curiosity arose about which laws of science operate to make these things happen. This essay is my humble attempt at trying to understand them.

I have been exploring and writing about these issues since 1977 though the desire to understand them started from my childhood. These ideas since 1977 were initially written in a diary form and then distilled in my first book, "Nature of Human Thought" which was published in 2004 and its second edition in 2010. Recently I have written another book "Exploring the Mind of God – How Technology Guided by Spirituality Can Produce Happiness" which extends and explores mind-matter interaction issues further. The present essay expands further on most of the material from these books.

Most of the times scientists scoff at these conjectural ideas and term them pseudo-science. However if in early 1800s somebody had told mankind about Einstein's theory of relativity and the space-time continuum, people would have had the same reaction as today's so called hard-core scientists have

about mind/matter subjects. *The black magic of today is often the science of tomorrow!*

The spirit of science encourages us to conjecture and our imagination to flower and the only validity of such conjectures is the proof from the experiments. It is my firm belief that we should have an open mind about mind/matter interaction and try to figure out how it could be possible.

Why Study Mind-Matter?

Curiosity is one part, but a major reason is that it may lead to a quantum jump in the evolution of mankind.

As we will show in subsequent sections, mind-matter interaction is an obvious consequence of deep thought hologram production and transmission. This deep thought or *Sanyam* according to Patanjali Yoga Sutras helps us get enlightenment, gives us great happiness and joy and leads to liberation from the cycle of birth and death. This is a major step towards the removal of pain.

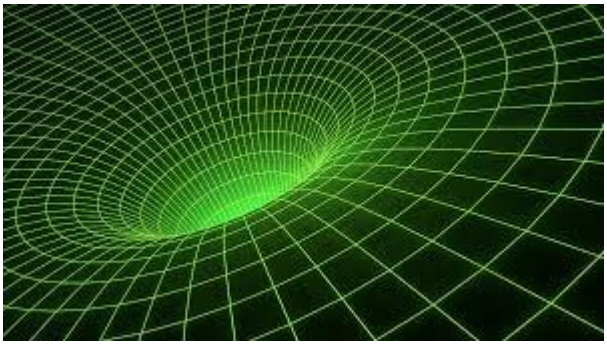
And the second reason is that mind-matter interaction may provide a possible mechanism for us to get out of the gravitational field of the earth and could make us an intergalactic travelling civilization. I firmly believe that our origins are extraterrestrial and we long to go back to our roots in distant galaxies and planets. These other worlds were probably our heavens of mythology.

Thought and Gravity interaction

As we have discussed in Section 3, a deep thought soliton can remain stable and travel to long distances. This can only happen when it can interact with space-time matrix. Or in other words, how can thought and gravity be correlated?

According to Albert Einstein gravity is nothing else but a curvature of space-time continuum and hence geometric in nature. *It is my conjecture that since*

the structure of deep thought soliton is also geometric, it is possible that both gravity and deep thought are related at a deeper level.



Also, according to the general theory of gravitation, light bends around massive bodies. This is because massive bodies distort the space-time matrix and the shortest path for light travel is geodesic. Hence light appears to bend when it passes heavy bodies like sun. This was one of the great triumphs of Einstein's theory of gravitation.

Since gravity bends light, we can conjecture by principle of equivalence that light should also bend the space-time matrix! This is the line of thinking we will employ in our quest to find the relationship between deep human thought and gravity.

Gravitation theory also shows that a combination of energy and momentum can curve space-time matrix. Though photons are massless particles, they have energy and momentum – two important attributes for bending space-time matrix. *Hence light travelling through it should be able to change the matrix shape.*

However, the effect is miniscule and is extremely difficult to measure since photons have very little energy and momentum. Nevertheless, it could be possible that high intensity light should be able to deform it. Recently some theoretical studies have shown the effect of lasers on space-time matrix deformation.

Extrapolating on this idea, one can conjecture that laser-like *deep thought soliton may have enough energy to deform the space-time matrix just like a mass would do and produce mechanical effects.* This could be the basis of

mind-matter interaction. However, the mechanical effect may be very feeble to observe.

The Science of resonance may be able to explain how these effects can be amplified. Also, this interaction of intense thought hologram with space-time matrix may also help in memory formation in knowledge space (KS).

Resonance magnification

All systems in the Universe possess natural frequencies and when these frequencies are matched by those creating the disturbance large scale mechanical effects are observed. A classic example is the child on a swing. A slight push at the right time to the swing can make it go higher and higher.

Similarly, certain notes played on musical instruments can shatter wine glasses. In the same manner some of the modern bridges were destroyed when the marching steps of the soldiers on the bridge matched the natural frequency of the bridge.

All these effects show that a small force can create large mechanical changes when the natural frequencies of the system are reinforced by a small mechanical force. This is the genesis of Butterfly effect generally described in chaos theory and is an outcome of non-linear dynamics of the system.

Thus, it can be conjectured that a deep thought soliton may somehow interact with the space-time matrix in a non-linear way to effect large scale mechanical changes. We still do not know how this might take place since the natural frequency of space-time matrix is still a mystery.

This process however may be able to explain the movement of physical objects by thought (psychokinesis) and poltergeist phenomenon where the presence of a troubled person brings in abrupt movements of the physical objects like stones, furniture, etc. Generally, the troubled person is capable of very strong emotional thoughts.

Mahasamadhi or the Final Exit

It may be tempting to speculate whether deep thought soliton may help a person to leave his body by will? Normally death happens by old age, disease or by accident. In these cases, the person has no control over the time or how the death will take place. However there have been instances like that of Swami Vivekananda leaving his body by will.

Sometimes it seems that the physical structure of brain and the body is required to reach the stage of highly non-linear thought and once the deep thought soliton is achieved the body's function is over and the liberation of a being from the cycle of birth and death results. Sage Patanjali says that this stage could be achieved by *Dharmamegha Samadhi* (Section IV.29).

I therefore feel that deep thought soliton wave may be responsible for *Mahasamadhi* of great rishis and enlightened souls which enabled them to leave the body at will guided by the gravity of celestial bodies like sun and stars. This is probably the most economical way energy-wise to leave the gravity of earth.

Ancients, it seems, did know about the relationship of gravity and thought. It can be conjectured that huge pyramids and stone temples could be gravity antennas used for passage of soul or tunning into universal consciousness.

It is also very tempting to speculate that understanding the production of thought like soliton, and its interaction with space-time matrix, may provide a possible mechanism for teleportation and propulsion for overcoming gravity, and help mankind in intergalactic space travel!

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About the Author

Dr. Anil K. Rajvanshi has more than 42 years of experience in renewable energy R&D and rural development. He did his B.Tech and M.Tech in Mechanical Engineering from Indian Institute of Technology (IIT) Kanpur in 1972 and 1974 respectively. He received his Ph.D. in Mech. Engg. from University of Florida, Gainesville, USA in 1979 under solar energy pioneer Dr. Eric Farber. He was on the faculty of University of Florida (Dept. of Mechanical Engineering) for 2 years before returning to India in 1981 to run his own rural NGO – Nimbkar Agricultural Research Institute (NARI) in Phaltan, Maharashtra.

NARI has done pioneering work in agriculture, renewable energy, and sustainable development, especially those affecting rural population. Dr. Rajvanshi has devoted the last 44 years at NARI to apply sophisticated science and technology to solve the problems faced by the rural people in the areas of energy, water, pollution, and income generation; broadly based on use of renewable energy in environmentally sound ways.

Dr. Rajvanshi has written extensively on his work on rural self-sufficiency. He has more than 250 publications; seven books and chapters in various books; and 7 patents to his credit. He has been inducted into several prominent committees of the government of India at the national and state level. He is the principal author of the Govt. of India national policy on Energy Self Sufficient Talukas.

For his work, Dr. Rajvanshi has received a number of prestigious national and international awards, such as Jamnalal Bajaj Award; induction to the U.S. based Solar Hall of Fame; Austria based Energy Globe Award**;** Federation of Indian Chambers of Commerce and Industries (FICCI) Annual Award; Sweden based Globe Award; Distinguished Alumnus Award from University of Florida (he is the first Indian to receive this award); Padma Shri (one of the highest civilian awards from GOI); Distinguished Alumnus Award from IIT Kanpur; Legends of IIT Kanpur; among others.

He has been a featured speaker at many prominent institutes, conferences, and forums, both in India and abroad and lectures regularly on the issues of sustainability and rural development.

Besides his engineering work, he is also involved in studies of human consciousness and the interaction of spirituality and technology. His writings on these issues have appeared regularly in Times of India; Huffington Post ; Thrive Global; South Asia Monitor, among others.

Books authored by him are: Nature of Human Thought; 1970s America-An Indian Student's Journey; Romance of Innovation; Autobiography of an Ordinary Indian; Exploring the Mind of God; Deep Science in Patanjali Yoga Sutras.